

White Paper Review of Low Impact Development Performance Standards

To Support the Development of a Model Ordinance for Low Impact
Development Strategies

Updated to reflect Final Model Ordinance Dated 7/21/2022



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1 EXECUTIVE SUMMARY

This White Paper was created as a companion document to a Model Ordinance for Low Impact Development (LID) Strategies for Maine (Model Ordinance). It is designed to present the rationale behind the performance standards that will be included in the Model Ordinance. The White Paper provides a review and comparison of LID performance standards implemented and/or recommended by other entities in Maine, Vermont, Massachusetts, New Hampshire, New Jersey, and Maryland. It also provides recommendations for which performance standards should be included or excluded and why. The Goals of the Model Ordinance for LID Strategies are to:

- meet the requirements of the 2022 General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s) which applies to 30 municipalities in Maine;
- help protect natural resources from the adverse impacts of new development;
- help correct adverse impacts from historical development during redevelopment;
- provide resiliency measures against future adverse impacts from climate change as outlined in the Maine Climate Council Document, “Maine Won’t Wait.”; and

- to the extent possible, be consistent with Maine state development requirements of Chapter 500 stormwater rules to avoid conflicts between municipal and state development rules during implementation by developers, contractors and state and local regulators of development.

Implementation of LID strategies provides many benefits to municipalities, their residents, developers, and the environment. As acknowledged by USEPA, there are also many challenges to incorporating LID strategies into municipal ordinances. This paper describes the benefits and challenges, and attempts to address them in its recommendations.

Table 1 of this White Paper provides a listing of the recommended performance standards organized under subheadings which address the LID Measures required in the MS4 General Permit. The Model Ordinance will incorporate these recommendations and will be made available as a tool for municipalities moving forward.

Section 5 of this White Paper describes some considerations for municipalities who will adopt the Model Ordinance. Section 6 describes recommendations and needs moving forward.

2 Introduction

This White Paper was created as a companion document to a Model Ordinance for Low Impact Development (LID) Strategies for Maine (Model Ordinance). It is designed to present the rationale behind the performance standards that will be included in the Model Ordinance. The White Paper provides a review and comparison of LID performance standards implemented and/or recommended by other jurisdictions including Maine, Vermont, Massachusetts, New Hampshire, New Jersey, and Maryland. It also provides recommendations for performance standards and a rationale for which were included, which were excluded and why.

The term “LID” refers to a broader approach to site planning that preserves natural resources, processes, and habitat, defines what portions of the site are suitable for development and then utilizes stormwater treatment Best Management Practices (which are referred to as Stormwater Treatment Measures in Maine DEP Chapter 500) to manage runoff from the proposed developed impervious areas. In LID, Stormwater Treatment Measures using natural processes such as vegetated buffers are given preference over constructed treatment Stormwater Treatment Measures. The goals of LID are to minimize the environmental impacts of the development.

This White Paper and Model Ordinance are focused on developing performance standards that address the LID Measures listed in Table 1, Appendix F of the Maine MS4 General Permit (Reference 1). The measures are: Minimize Site Clearing, Protect the Natural Drainage System,

Minimize the Decrease in Time of Concentration (rate of flow), Minimize Impervious Area or the Effect of Impervious Area, Minimize Soil Compaction, Minimize Lawns and Maximize Landscaping that Encourages Stormwater Runoff Retention, Provide Vegetated Open-channel Conveyance Systems, Rainwater Capture and Reuse, and Stormwater Quality Treatment and Retention.

Many of these measures are overlapping (by minimizing site clearing, a developer would also minimize soil compaction), and some are potentially conflicting (by minimizing site clearing, a developer may inadvertently disrupt the natural drainage system). Additionally, development sites are unique, so not all of the measures will apply to every site. Therefore, the performance standards will allow some exceptions to be taken, similar to waivers that are allowed for other municipal ordinances. Finally, there are a number of Maine State regulations and local municipal ordinances that also sometimes overlap and sometimes conflict with LID.

The remainder of this introductory section provides a brief summary of the benefits of and needs for a Model Ordinance, the goals of the Model Ordinance, the process used to select the references and develop the White Paper and Model Ordinance, as well as the challenges and barriers to implementing LID in Maine.

2.1 Benefits and Need for LID Strategies

LID strategies provide many benefits to developers, municipalities, and residents over conventional stormwater management approaches (Ref. 1). Benefits to developers and owners include lower costs due to decreased grading, land clearing and infrastructure. Benefits to municipalities include reduced property damage from flooding, increased open space, better

protected natural resources, public health benefits, improved “quality of place,” economic benefits, and better water quality. Benefits to the environment include reduced urban heat island effect, mitigating climate change by sequestering carbon, minimizing erosion, improved base stream flows, greater preservation of natural hydrological function which in turn benefits fish and wildlife, and enhanced resilience to climate change impacts, including increasing precipitation. Some LID strategies, such as green roofs may even reduce energy costs.

Maine communities face unique and pressing challenges related to managing stormwater in order to protect water quality, address flood risk, and preserve ecosystem health. Growing development and redevelopment pressure in the region brings the threat of increased impervious cover, stormwater runoff, water pollution, and flooding. Climate change compounds that threat, with the region expected to experience even more intense and frequent rainfall events than the region is currently experiencing. According to the Maine Climate Council Scientific and Technical Subcommittee (Maine Won’t Wait - Reference 17), statewide, annual precipitation has already increased by six inches since 1895 and the average number of heavy precipitation events per year has increased, particularly since the mid-2000s. Most climate models project that Maine will continue to get wetter over the next century as increased heating intensifies the hydrologic cycle. Current stormwater management measures and standards are inadequate for addressing the threats, challenges, and impacts posed by climate change.

LID can help to alleviate local flooding by managing stormwater in a way that reduces the impact of built areas and preserves the natural (pre-development) movement of water within a

watershed, improving resiliency of the surrounding area. The Maine Climate Council Community Resilience Planning Working Group acknowledged this in their contribution to Strategy F of the Maine Climate Action Plan, “Build Healthy and Resilient Communities,” with specific recommendations to “Require and/or further incentivize the use of LID approaches in Chapter 500”. (Ref 20 Community Resilience Planning Final Strategy Recommendations page A6).

While some Maine communities have land use ordinance language encouraging the use of LID strategies for certain types of development and a small number have some requirements with varying standards, most communities lack specific guidance, requirements, and standards for LID. Additionally, 30 Maine communities subject to the 2022 General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s) are being required to develop a Model Ordinance with LID performance standards and incorporate the performance standards into their land use ordinances by June 30, 2024.

The timing of the new General Permit requirement is consistent with the Maine Climate Council Strategy F recommendations (References 20, 21 and 22), which identified that the Maine DEP would “develop and implement updated land-use regulations, and practices by 2024 to enhance community resilience to flooding and other climate impacts.”. The timing is also consistent with LD 1572 and Public Law Chapter 67, known as the Resolve To Analyze the Impact of Sea Level Rise, which required specific State agencies to review the laws and rules they are charged with administering, and recommend to the Legislature any changes necessary to incorporate specific sea level rise projections for 2050 and 2100 into administration of those

laws and rules and to implement Strategy F3 of the Maine Climate Council to enhance community resilience to flooding and other climate impacts. A report outlining those recommendations was presented to the legislature in January 2022; it specifically states that the Maine Department of Environmental Protection will revise Chapter 500, beginning the consensus-based update process in 2022. In that manner, the revisions to Chapter 500 can complement the development of this model LID ordinance.

2.2 Goals of Model Ordinance for LID Strategies

The Goals of the Model Ordinance for LID Strategies are to:

- meet the requirements of the 2022 MS4 General Permit which applies to 30 municipalities in Maine;
- help protect natural resources from the adverse impacts of new development; help correct adverse impacts from historical development during redevelopment;
- provide resiliency measures against future adverse impacts from climate change as outlined in the Maine Climate Council document, “Maine Won’t Wait;” and
- be consistent with Maine state development requirements of Chapter 500 stormwater rules to avoid conflicts between municipal and state development rules during implementation by developers, contractors and state and local regulators of development.

2.3 Challenges and Barriers to Implementing LID

USEPA acknowledges that local municipal codes can contain many obstacles to implementing LID (Ref. 17 USEPA 2021). Additionally, existing State of Maine regulations pose challenges or barriers to implementation of LID strategies. In some instances, existing local or state regulations already contain performance standards that either conflict with LID strategies or already address LID strategies. Even when other local or state regulations already contain LID strategies, they may not address the strategy with sufficient stringency to provide natural resource protections because they are out of date. In some instances, it was not possible to develop and include a performance standard because it would conflict with an existing state regulation or statute.

Finally, even within the suite of LID strategies that are being implemented across the country, some LID strategies conflict with other LID strategies depending on the type site being developed or redeveloped. The following are examples of these conflicts which this white paper has attempted to address in order to provide recommendations for the Model Ordinance:

- Redevelopment projects in urban settings with limited space require a different perspective on LID than redevelopment in suburban or rural areas. For example, urban sites may have limited space for on-site open space or open channel flow treatment measures, so performance standards such as “minimize site clearing” may not apply and different treatment standards may be more appropriate. The recommendations provided in this White Paper identify which elements should be applied to urban, suburban, rural or all settings.

- Creating municipal requirements that are different than state requirements can be perceived as more stringent regulation. This is especially true for regulations targeting redevelopment, which can have the unintended consequence of pushing development out of urban areas and into rural areas, which can impact headwaters and more pristine environments. This White Paper recommends that the State continue to prioritize revision of Chapter 500, so that there will be more uniform regulation of stormwater runoff throughout the State.
- Each development site is unique, presenting its own challenges. LID strategies may not all work on a given site. Some flexibility must be built into the requirements and standards. As such the performance standards recommended in this White Paper contain provisions for relief or exceptions which can be used as waivers.

The following subsections provide additional perspective on the importance of understanding the overlaps between LID and existing State regulations, including the challenges and barriers to identifying meaningful LID recommendations in Maine.

2.3.1 Chapter 500 Stormwater Management

The required threshold for the Model Ordinance is the same as the current Chapter 500 Permit-By-Rule (PBR) threshold which is: sites disturbing one or more acres of land (or less than one acre of land if part of a common plan of development). However, at the state level, these PBR sites are only required to implement the Chapter 500 Erosion and Sediment Control (ESC) standards in Appendices A and B. PBR sites are not required by the State to perform hydrologic analysis, or treat stormwater for quality or quantity until they reach the State thresholds for the

General Standards, which are 5 acres of developed area or 1 acre of impervious area (or 20,000 square feet of impervious area in the direct watershed of a lake most-at risk or an Urban Impaired Stream). With the implementation of the Model Ordinance, sites that only trigger ESC requirements at the state level will be required to also address the LID requirements of the Model Ordinance in MS4 areas.

Even though the Model Ordinance will trigger smaller sites than those regulated by Chapter 500, a recent study by the Southeast Watershed Alliance under a grant from NOAA (Ref 25) shows that even smaller thresholds than the one-acre threshold should be adopted to minimize environmental impacts. This is especially true for redevelopment sites, which are focused in urban areas and rarely trigger the state threshold of one acre of disturbance.

It should also be noted that sites that are large enough to trigger the Chapter 500 General or Phosphorus Standards (requiring water quality treatment) will also need to meet the MS4 LID Performance Standards. So, the model LID Performance Standards must not conflict with the Chapter 500 Development Standards.

2.3.2 Chapter 1000 Shoreland Zoning

The Maine Shoreland Zoning Act provides additional water quality protections that support Low Impact Development. In Maine, municipalities must adopt and implement Shoreland Zoning Ordinances consistent with, or no less stringent than, the minimum guidelines laid out in Maine DEP Chapter 1000: Guidelines for Municipal Shoreland Zoning Ordinances. Communities with Shoreland Zoning Ordinances already regulate, at a minimum, land use activities within 250 feet of great ponds, rivers, freshwater, and coastal wetlands, and within 75 feet of streams in order

to protect buffers and natural resources (a significant element of LID). The regulations limit the extent to which existing structures can be expanded within the shoreland zone and prohibit most new structures and uses unless permitted by either a planning board or code enforcement officer. These restrictions in the Shoreland Zone are consistent with LID Strategies. Maine MS4 municipalities have already adopted varying versions of Shoreland Zoning Ordinances, so these restrictions are not repeated as part of the recommendations for the Model Ordinance. Any additional or supplemental LID performance standards recommended in this White Paper should be consistent with the municipal-specific Shoreland Zoning Ordinances.

2.3.3 Natural Resources Protection Act

Maine's Natural Resources Protection Act (NRPA), and its associated rule, Chapter 310, regulate activities adjacent to and in waters and wetlands in the state. While NRPA provides some good protections consistent with the LID strategies, it also provides some exemptions that go against LID strategies. One example of how NRPA conflicts with LID strategies is that it contains an in-lieu fee (ILF) compensation program which allows developers to build over wetlands if they pay a compensation fee. Although the ILF goes into a compensation grant pool for later use in creating and/or enhancing wetlands, the fees are not required to be used to benefit wetlands within the same watershed as where the wetland removal or impacts occurred.

There are also some exemptions associated with small wetlands alterations, and allowances for sites that have been subdivided and are being developed separately, allowing a developer to get multiple exemptions from the regulations that might normally apply. Finally, it is difficult for

small urban sites to be selected for wetlands improvements using the compensation funds because these wetlands are often considered lower value.

It is beyond the scope of this White Paper and the Model Ordinance to provide recommendations associated with these issues, but the model LID performance standards should be consistent, or at least not conflict, with existing State regulations. These barriers to implementation can be shared with the Maine DEP to address as it implements the changes necessary to implement Climate Council Recommendations. Section 6 of this White Paper contains the recommendations to be considered during the Chapter 500 updates.

2.3.4 Current Maine Subdivision Practices

Municipalities in Maine are required to regulated development of subdivisions in accordance with R.S.A Title 30 § 4401 through 4408. Typically, Maine municipalities promulgate subdivision ordinances with processes and performance standards that are distinct from the site plan review processes and performance standards (which are applicable to industrial, commercial, and single-family home developments).

MS4 subdivision regulations are diverse, with some community codes containing separate standards for traditional, cluster and/or conservation subdivisions, while others have embedded differing standards based on Zoning Districts. Most of these subdivision regulations identify minimum lot sizes and open space requirements based on Zoning District. The lot size and open space requirements are typically based on whether the Zone is already provided with public water and sewer, likely to be provided with water and sewer (because of close

proximity), already or likely to be provided with just water (because of close proximity), or likely never to be provided with water and/or sewer because of Comprehensive Plan goals related to retaining the rural character of the land. Areas where public water and sewer are likely never to be provided with water and sewer are allowed larger minimum lot sizes to accommodate wells and septic systems in close proximity safely, but these areas also have open space requirements. On the other end of the spectrum, areas that are already provided with public water and sewer typically have smaller minimum lot sizes (increased density) with smaller open space requirements because these areas are in highly developed areas.

Once community's current strategy is as follows:

1. To require cluster subdivisions in medium density zones to reduce lot size and setback standards allowing for more compact development on areas of the site that are more suited for development, but requiring open space to preserve undeveloped areas to minimize impact on the environment. Because development is situated closer together, roads and utilities are reduced (smaller impervious foot prints). Open space requirements are 25% of total development area.
2. To require conservation subdivisions in those zones that are more rural (RR1 and RR2) instead of cluster subdivisions. These areas are allowed larger minimum lots sizes, but also have larger open space requirements and buffer requirements around any subdivision (75 feet around low traffic roads, 150 feet around high traffic roads). Open space requirements for conservation subdivisions are 50% of the total development area. The area to be dedicated as open space must prioritize the

preservation of “high-value conservation areas” such as existing trails, existing healthy native forests of at least one contiguous acre, habitats of endangered or threatened species, etc.

A community can choose to adopt cluster and/or conservation standards with flexibility as to where such developments can be located and how much open space is required. By requiring that the open space be an integral part of the design process, the community (typically through the Planning Board) receives information on the natural resources on-site including wetlands, water bodies, slopes, and the natural drainage patterns. Cluster and conservation subdivisions lend themselves well to LID because the purpose is to preserve existing natural resources, minimize developed areas and place development where it is least impactful. Many, but not all of Maine’s MS4 municipalities already promote these types of developments in their ordinances, and some have adopted the concepts and standards within their “traditional” subdivision regulations without calling the subdivisions “cluster” or “conservation”.

Municipalities will need to carefully cross check their subdivision regulation content with and against these LID recommendations.

3 Process

3.1 Grant Funding and Contributors

Southern Maine Planning and Development Commission (SMPDC) partnered with the Cumberland County Soil and Water Conservation District (CCSWCD) to apply for a Maine

Coastal Program Coastal Communities Grant to develop this White Paper and the Model Ordinance for LID Strategies.

The SMPDC and CCSWCD partners had already worked successfully together on a separate but related set of ordinance recommendations using an Ordinance Committee format consisting of representatives from the Interlocal Stormwater Working Group (ISWG) and the Southern Maine Stormwater Working Group (SMSWG). These two organizations are coalitions of MS4 regulated coastal and non-coastal communities in York and Cumberland Counties. As the work began, the representatives from the other two Maine MS4 coalitions, the Bangor Area Stormwater Working Group (BASWG) and the Androscoggin Valley Stormwater Working Group (AVSWG) joined the Ordinance Committee.

Several non-municipal organizations also joined the Ordinance Committee. In particular, Friends of Casco Bay attended and offered technical assistance in reviewing ordinance language and guidance documents.

The partners had used Integrated Environmental Engineering as a technical resource for prior work with the Ordinance Committee and continued to use their technical services for this White Paper and Model Ordinance with additional support from a Technical Expert Panel. The law firm of Perkins Thompson, Inc. will provide legal review of the Model Ordinance.

The Ordinance Committee and Technical Expert Panel met on several occasions to review the project documents being prepared and to discuss comments. The MS4 General Permit requires that the Model Ordinance be submitted to the Maine Department of Environmental Protection

by September 1, 2022, for review, and then will be issued for public comment. Each MS4 permittee must adopt an ordinance or regulatory mechanism that is at least as stringent as the required elements of the Model LID Ordinance on or before July 1, 2024.

Figure 1 shows the overall timeline for the project, including meetings held by both the Technical Expert Panel and full Ordinance Committee. Appendix A contains a listing of the Ordinance Committee members and Technical Expert Panel members who contributed to this work.

3.2 Measures Required by the MS4 General Permit

The 2022 MS4 General Permit requires each permittee to develop a Model LID Ordinance for stormwater management on new and redevelopment sites which establishes performance standards for LID Measures identified in Table 1, Appendix F of the MS4 General Permit.

The LID Measures listed in Table 1, Appendix F of the Maine MS4 General Permit are as follows:

1. Minimize site clearing
2. Protect natural drainage system
3. Minimize the decrease in time of concentration
4. Minimize impervious area*
5. Minimize the effect of impervious area*
6. Minimize soil compaction
7. Minimize lawns and maximize landscaping that encourages stormwater runoff retention
8. Provide vegetated open-channel conveyance systems

9. Rainwater is stored for later reuse for the building or landscape (Rainwater Capture and Reuse)

10. Stormwater Quality Treatment and Retention Requirements

As stated in the MS4 General Permit, the Model Ordinance must contain performance standards for each of these LID Measures.

*Note: Measures 4 and 5 are listed in the Maine MS4 General Permit as a single measure but have been segregated out because they will likely contain different performance standards.

3.3 Selection of Technical References for Review

The initial grant proposal for this project identified several references to be reviewed and summarized in order to identify performance standards that would be appropriate for the Model Ordinance. Additional references were identified by Ordinance Committee members and the Technical Expert Panel during the first months of the project.

The listing of references reviewed includes the Maine Climate Council recommendations; New Hampshire, and Massachusetts MS4 requirements; LID guidance from Vermont, New Jersey, and Prince Georges County Maryland (which is part of the Chesapeake Bay Watershed); and several Maine guidance documents related to LID.

Ordinance Committee members also recommended review and incorporation of performance standards from the 1999 Better Site Design Manual; however, the Center for Watershed Protection updated this Manual in 2017 and renamed it: Codes and Ordinances Worksheet. The Codes and Ordinances Worksheet was reviewed instead of the Better Site Design Manual.

The final listing of references reviewed is contained in Section 6 of this White Paper.

LID Strategies Project Timeline

KEY
 Blue – Workshops/meetings
 Orange – Permit dates
 Purple – Technical Review Panel
 Green – Ordinance Committee
 Black – Project team

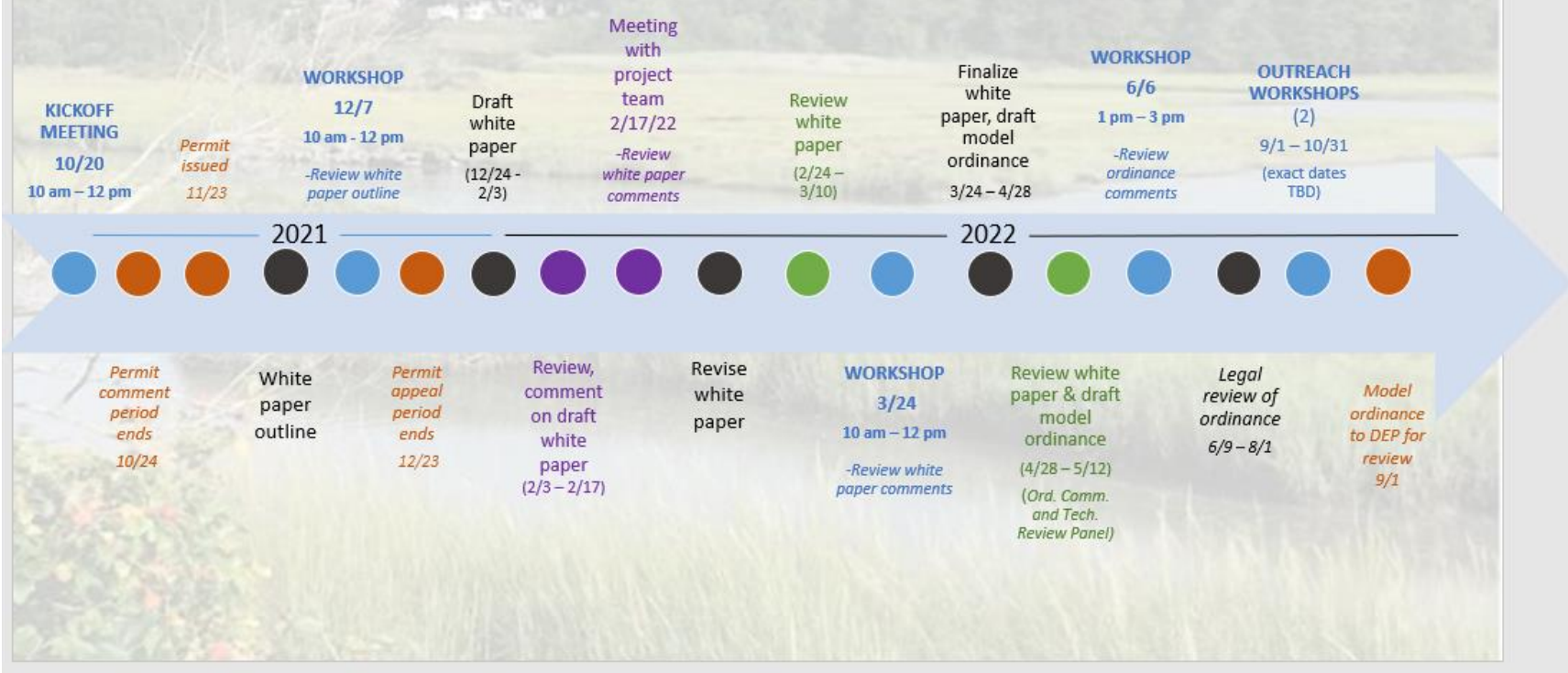


Figure 1 Project Timeline and Major Milestones

4 Review of LID Measures and Selection of Performance Standards

Each of the technical references described in Section 3 was reviewed and compared to the 10 LID Measures required to be addressed by the MS4 General Permit. In addition, several other measures were identified that are not required by the MS4 General Permit but were deemed to be important to LID by the Ordinance Committee and Technical Expert Panel, such as snow management and chloride control. Appendix B contains the spreadsheet used to conduct the review and comparison. The spreadsheet was designed to allow comparison of the various recommended performance standards. Each column of the spreadsheet contains information from one of the technical references, and each row contains the performance standards organized by the MS4 required LID Measures. So, a review across the rows of the spreadsheet shows how the different states recommend addressing the LID Measure.

The full spreadsheet (Appendix B) contains some instances of performance standards in quotations (verbatim from the reference), but some performance standards are paraphrased for brevity and clarity of intent. The electronic version of the spreadsheet should be reviewed on a large computer screen, for ease of comparison.

Finally, the spreadsheet (Appendix B) is color coded to identify performance standards that should be required in the Model Ordinance in brown, bold text and performance standards that should be optional in blue italics text. Normal font black text is provided for information only.

Table 1 provides a summary of the recommendations for the required and optional performance standards from the full Appendix B spreadsheet (i.e., any performance standards that are not recommended for the Model Ordinance are not included on Table 1).

Most of the documents reviewed acknowledge that incorporation of LID performance standards into municipal codes will look different in a highly urban environment during re-development than it will in a suburban location or rural location. In particular the Codes and Ordinances Worksheet (Center for Watershed protection Ref. 13) recommends development of separate standards for rural, suburban, and urban landscapes. As such, each recommended performance standard in Table 1 contains a categorization after it in parentheses to indicate if it is applicable to an urban, suburban, or rural location. In making these assignments, the following assumptions were used:

- Rural Areas: most development in rural areas is new development, where the project site has relatively undisturbed area, natural hydrology, or has been developed for agriculture. Rural areas are likely categorized by municipalities on their zoning maps with the word “Rural” as an adjective. They are areas where water and/or sewer are not likely to be provided because these areas are far away from major population centers, so extensions of these utilities is not cost effective. Lot sizes and/or developable area would likely be larger in these so there is sufficient space to install stormwater quality treatment measures with considerations for the need for septic systems and drinking water wells.

- Suburban Areas: most development in suburban areas is either new development, similar to rural areas, or redevelopment of larger previously developed sites with opportunity for open areas and restoration of natural hydrology. Most municipalities have areas designated in their zoning ordinances with the adjectives “Low or Medium Density”.
- Urban Areas: most development in urban areas has covered over natural areas with paved or roofed surfaces, so preservation of these elements is not possible, but restoration, or minimizing the effects of impervious cover could be implemented. There will likely be space constraints associated with redevelopment of these properties. Most municipalities have identified these in their zoning ordinances with adjectives like “High Density” or “Village” or “City” or “Commercial” or “Industrial.”

Municipalities will need to assess their own municipal codes and make determinations as to how these standards will apply in their communities. Using a zoning approach as described in the bullets above is one possible way municipalities will apply these standards.

Additionally, most of the documents reviewed contained general recommendations and phraseology that promotes the concepts but not in a way that would be enforceable by a municipality as part of their code. Phrases such as “wherever practicable” and “whenever possible” and to the “maximum extent practicable” were commonly found and require the developer to provide rationale as to why something could or could not be applied at a site.

Although not ideal, some of the recommendations provided in Table 1 do contain this language in the absence of any specific standard.

The following subsections provide a brief discussion of each required LID Measure and the performance standards contained in the references reviewed as detailed in Appendix B followed by the recommended performance standards that were selected for the Model Ordinance.

Table 1 Summary of Recommended LID Performance Standards

Required LID Measure	Recommended Performance Standard	Applicability
1 - Minimize Site Clearing	<p>a. Require that all Applicants provide an inventory of Sensitive Areas present on site pre-development as part of the development application and prioritize their protection as listed below (highest priority listed first)</p> <ul style="list-style-type: none"> i. Waters of the State and their associated shoreland protection areas. ii. Protected Natural Resources iii. Predevelopment drainageways iv. High Permeability Soils v. Maine Native and Climate-Resilient Northeastern Native Vegetation in General Buffer areas and Shoreland Zoning Buffer Areas vi. Significant and Essential Wildlife Habitats <p>b. Require that all developments show limits of disturbance on all site plans and on-site prior to disturbance.</p> <p>Include as optional recommendations:</p> <p>For sites that create more than 5,000 square feet of impervious area, require compliance with the LID Model Ordinance.</p> <p>Require Rural new developments to preserve at least 40% of the development as open space and Suburban new developments to preserve 25% of the development as open space.</p> <p>Exception: Municipalities may allow exceptions per their municipal ordinances. For example, applicants may be allowed to pay a fee-in-lieu which is dedicated to open space or may provide open space in an alternate locations within the same watershed</p>	As noted in recommendation

	<p>Exception: Removal of Maine Native Vegetation and Climate Resilient Northeastern Native Vegetation that is diseased or in poor condition is allowed.</p> <p>These elements also address Measures 2, 4, 5, 6, and 7.</p>	
<p>2 - Protect natural drainage system</p>	<p>Require that Culvert crossings for any waters of the state use Maine Stream Smart Principles to preserve the natural pre-development drainageways.</p> <p>Require that Rural and Suburban developments preserve the natural pre-development Drainageways on site by using the natural flow patterns and pathways for the post-construction drainage system.</p> <p>This elements also address Measure 3 Exception: Stream Crossings over portions of streams that are artificially channelized are not subject to this standard. The applicant may submit an alternative analysis which demonstrates that this performance standard is impracticable. Exceptions are also allowed if the Time of Concentration for a predevelopment Drainageway is the same as or shorter than the post-development Drainageway.</p>	<p>Rural, Suburban and Urban</p>
<p>3 - Minimize the decrease in time of concentration</p>	<p>Require volume control on-site (through infiltration or storage) in accordance with the following:</p> <ul style="list-style-type: none"> • Volume to be controlled= (total area of impervious cover after development – total area that existed before development) x Rd • Where Rd = 0.40 inches of rain for type A soils, 0.25 inches of rain for type B soils, 0.10 inches of rain for type C soils and 0 for type D soils • Restrictions and requirements identified in Appendix D Infiltration basins, drywells, and subsurface fluid distribution systems; of Chapter 500 apply. 	<p>Rural, Suburban and Urban</p>

	<p>Stormwater Treatment Measures with liners may not be used to meet the volume requirement via storage.</p> <p>Restrictions and requirements identified in Sections D(2) through D(4) of Appendix D Infiltration basins, drywells, and subsurface fluid distribution systems; of Chapter 500 apply. This includes an exception if any Uncontrolled Hazardous Substance Sites, Voluntary Response Action Program sites, RCRA Corrective Action sites, or Petroleum Remediation sites are on or adjacent to the Site.</p> <p>For sites where infiltration is limited or not practicable, the applicant must demonstrate that the project will not create or contribute to water quality impairment.</p> <p>Exception: Municipalities may allow infiltration on an alternate site within the same watershed in-lieu of on-site infiltration.</p> <p>This element also addresses Measures 2 and 5</p>	
<p>4 - Minimize impervious area</p>	<p>Minimize the impervious surfaces on the site using at the following standards (developer provides narrative describing why standards cannot be achieved at site if “exception” is requested):</p> <p>Buildings: No specific Standards</p> <p><u>Roads:</u></p> <p>Optional: Require that Dead-end streets be no longer than 1000 feet (rural and suburban areas).</p> <p>Optional: Dead-end roads shall be constructed to provide a hammerhead (when less than 200 feet), or a tear drop cul-de-sac turn-around with a center that is vegetated, used for open space, and/or a Stormwater Treatment Measure as described below (Rural and Suburban Areas).</p> <p>Optional: Require that Cul-de-sac roads be constructed with the center used for Stormwater Treatment Measures unless type A or B soils are present in the center, in which case this area should be used to</p>	<p>As noted in recommendation</p>

	<p>promote natural infiltration on-site (rural and suburban areas).</p> <p><u>Parking:</u></p> <p>Incorporate maximum car parking standards: 9-foot by 18-foot vehicle space size Allow exception for public safety.</p> <p><u>Optional Standards</u> (not to be fully developed for Model Ordinance): In highly urban areas – offer waiver for min. parking standards.</p> <ul style="list-style-type: none"> • Establish “In Lieu of” Parking programs with the following components: <ul style="list-style-type: none"> ○ Fee in lieu of parking ○ Car-share-in-lieu of parking ○ Transit-in-lieu ○ Bike/pedestrian infrastructure improvements • Note that the in-lieu program may optionally be tied to incentives, such as density or height bonuses. • Establish shared parking provisions • Parking lot travel aisles shall be a maximum of 22 feet wide. • Required garages/under above building where appropriate, optionally tied to a density or height bonus. • Incorporate maximum commercial parking space size with a 9-foot width and an 18-foot length and allow developers to reduce the 18-foot length if an equivalent overhang was provided in all developments. • Ensure parking volume requirements are up to date, including establishing maximum parking limits in appropriate areas. Reduction or elimination of parking may be conditional on presence of transit routes within ¼ mile, existing 	
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	<p>on-street parking, and creation of a transportation demand management (TDM) plan for projects over a certain size (10k SF in Portland).</p>	
<p>5 - Minimize the effect of impervious area</p>	<p>Require that 70% of roadway runoff be treated.</p> <p>Require that roof runoff be directed to Stormwater Treatment Buffers or Stormwater Treatment Infiltration Measures.</p> <p>Runoff from sidewalks and peak use overflow parking is directed into Stormwater Treatment Buffers or Stormwater Treatment Infiltration Measures.</p> <p>Exception: Notwithstanding other provisions in municipal ordinances or state law, requirements to plant “Maine Native Vegetation” or “Climate Resilient Northeast Native Vegetation” shall not be construed as a restriction on the rights of individuals to engage in agricultural practices that are legally protected by the Maine Agriculture Protection Act and the “Right to Food” provision in the Maine Constitution (Constitution, Art. I, §25).</p> <p>This element also address Measures 8 and 10.</p>	<p>Rural, Suburban and Urban</p>
<p>6 - Minimize soil compaction</p>	<p>Restrict construction equipment movement and parking to only the disturbed area or existing impervious area. See Measure 1 requirement to mark out areas on-site as well as on site plan.</p> <p>Require tilling of and the addition of organic matter if needed based on the results of soil tests to all areas to be vegetated.</p>	<p>Rural, Suburban and Urban</p>
<p>7 - Minimize lawns and maximize landscaping that encourages runoff retention</p>	<p>Require the use of Maine Native or climate-resilient Northeastern native plants in any General Buffer Area, or any Stormwater Treatment Buffer.</p> <p>Allow exception for</p> <p>Note that Measures 1, 4 and 5 also fulfil this Measure.</p>	<p>Rural, Suburban and Urban</p>
<p>8 - Provide vegetated open-</p>		

channel conveyance systems	Note that Measure 5 fulfils this Measure.	
9 - Rainwater Capture and Reuse	Include optional provision for the capture and re-use of water via cisterns or rain barrels for later reuse for landscaping or buildings.	Rural, Suburban and Urban
10 - Stormwater Quality Treatment and Retention Requirements	Require that sites that disturb one or more acres of land treat runoff according to the Maine DEP Chapter 500 General Standards. Require individual Stormwater Treatment Measures to treat a maximum of one acre of impervious area. Measure 3 Minimize decrease in time of concentration also helps fulfil this Measure.	Rural, Suburban and Urban
Other	Require that all site plans show snow storage areas. Prohibit snow storage from any Stormwater Treatment Measure, or Shoreland Buffer.	Rural, Suburban and Urban

The following sections describe the rationale for selection of the standards in Table 1. Some discussions and comments from the Ordinance Committee were provided during their comment opportunity which are not fully detailed here. During development of the Final Model Ordinance some language was modified to better reflect Chapter 500 definitions and some exceptions may have been refined. However, Table 1 and the majority of the discussion below contains the rationale for the selection of the final standards.

4.1 Measure 1 - Minimize Site Clearing

Discussion: This measure generally requires promotion of a compact development site (which applies to building, parking, road, and landscaped areas) as well as minimal site disturbance overall and aligning the development to protect “sensitive areas.” Most of the references reviewed did not have specific performance standards for sites that disturb one or more acres of land except for the following:

- Most Maine municipal subdivision regulations require the applicant provide an inventory of sensitive areas as part of the development application.
- Most Maine municipal Site Plan review procedures also require the applicant to provide inventories of site features such as streams, soil types, and wetland areas. Some also contain requirements to document trees and/or “significant vegetation”. There it is appropriate to expand the listing to other “sensitive areas” as recommended in several of the references reviewed.
- The Center for Watershed Protection Codes and Ordinances Worksheet (CWP COW) (Ref 13) recommends that all developments show limits of disturbance on all site plans. The Ordinance Committee suggested that the limits of disturbance all be marked out in the field and maintained throughout construction prior to any disturbance top facilitate enforcement of this requirement.
- For Rural and Suburban new developments, the CWP COW recommended that 50% of the buildable area be preserved as open space, though a second reference identified a set aside of 15% of any lot that was 6 acres or smaller. During the Ordinance Committee meetings, many representatives stated their ordinances had much smaller open space requirements for subdivisions (if any). However, some

Maine municipalities have open space requirements that are consistent with this but allow the open space to be a percentage of the overall parcel or project. Additionally, many communities are developing bike, walking and trail connectivity, and allow developments to provide open space in alternate locations rather than on the direct development site. The opens space considerations and potential conflicts were complex, so this was moved to be an optional standard.

- Preservation of existing native vegetation where practicable for all sites (Rural, Suburban and Urban), and prohibiting the removal of native vegetation in any buffer areas (see note in next bullet on buffer areas) with appropriate exemptions for planting of non-native, non-invasive species for food production or agroforestry. In addition to the reviewed references, the Town of Kittery identified that requiring only Maine native vegetation may limit the Town’s resiliency to climate change and now use these phrases "climate-resilient Northeastern native" or "native to the Northeast," selected for climate change tolerance.
- The term “Buffers” appears in Maine ordinances and regulations in at least three ways, and for clarity, they are summarized here, and will be defined in the LID Model Ordinance: Shoreland Zoning Buffers apply to the areas under protection by shoreland zoning ordinances and regulations (75 feet of any stream, 250 feet of any river, great pond, or upland edge of a coastal or freshwater wetland), General Buffers are typically referenced in Maine ordinances for purposes of screening refuse or other potentially objectionable items from adjacent properties, providing privacy in densely populated areas or for other general use, and Stormwater

Treatment Buffers are used specifically to treat stormwater as defined in Appendix F of Chapter 500 Vegetated Buffers. The requirements for existing native vegetation to be protected and used will apply to all three types of buffers.

- New Hampshire, New Jersey, and Maryland references (Refs 10, 11, 12, 14, and 15) promote protection of soils with high infiltration capacity (i.e., limiting development on high infiltrating soils). Maine DEP Chapter 500 has allowances and standards to allow infiltration, but most developments in Maine have Stormwater Treatment Measures that are lined to prevent infiltration as a way to protect groundwater from pollutant sources. It was made clear that this standard must use stormwater treatment measures that do not have liners to promote infiltration, and the Chapter 500 submittals and restrictions on infiltration will be adopted to protect groundwater from pollution.

Appendix A of Chapter 500 contains a basic standard to “minimize disturbed areas” without providing any other details as to how to fulfil this regulatory requirement. Also, as noted in Section 2.3, Shoreland Zoning and NRPA requirements provide protections of buffers by restricting development within 75 feet of any stream and 250 feet of any great pond, river, or freshwater or coastal wetlands.

There were two references that provided specific recommendations related to limiting disturbance on single family homes and new multi-family homes or non-residential development, but these were designed to be applied to sites that are smaller than one acre of disturbance and so were not recommended.

The Maine Climate Council documents recommended that Chapter 500 be adjusted to apply thresholds to smaller sites. The Maine Climate Adaptation Series, prepared in 2017 to address climate change issues, provided a specific recommendation to apply site plan review and stormwater treatment standards to sites that create 2,000 square feet of impervious cover (Ref 26). The New Hampshire Southeast Watershed Alliance recommends a threshold of 5,000 square feet of impervious cover (Ref 25).

A list of Sensitive Areas to be protected from disturbance and development was created for this Model Ordinance (See Table 1) using the Cumberland Maine Conservation Ordinance as a basis, with some modifications to identify statewide resources for identification and improved definitions.

Recommendation: To address LID Measure 1 – Minimize Site Clearing, the Model Ordinance should:

- Include as required measures the following performance standards:
 - require that all developments provide an inventory of Sensitive Areas as part of the development application,
 - require that all developments show limits of disturbance on all site plans and on site prior to site disturbance,
 - require preservation of existing climate-resilient Northeast native vegetation in General Buffer areas (used for landscape screening in many ordinances) and in any Stormwater Measure Treatment Buffers or systems for all sites (Rural, Suburban and Urban), and prohibit the removal of climate-resilient Northeast

native vegetation in any buffer areas with appropriate exemptions for planting of non-native, non-invasive species for food production or agroforestry. Note that Shoreland Zoning ordinances already require the use of Maine Native Species for replanting in their Buffer areas, so this requirement was not included in the Model LID Ordinance.

- Include as an optional recommendation, the following: For sites that create more than 5,000 square feet of new impervious cover, require compliance with LID Model Ordinance.
- Include as an optional recommendation, the following: Rural and Suburban new developments to preserve 40% and 25%, respectively, of the project area as open space, and (note this change from other jurisdictions, which required the set aside to be for the buildable area, which is more appropriate for Maine which has significant wetlands and bedrock areas)

Because Maine municipal ordinances likely already contain some version of these elements, the Model Ordinance should acknowledge that the requirements may be embedded in their applicable Subdivision or Site Plan Review sections of the municipal code.

4.2 Measure 2 - Protect Natural Drainage System

Discussion: Maine Shoreland Zoning and NRPA regulations already provide some protections of the natural drainage systems when the system is a stream, wetland, river, or great pond, and these protections exceed the 25-foot buffer recommendation in the 2022 MS4 General Permit. However, additional protections related to LID can be implemented including protection of intermittent channels that may not be identified as streams and

designing a site so it retains its natural pre-development watershed. Most references reviewed contained general statements requiring protection of the natural pre-development watersheds or drainage areas such as the Southeast Watershed Alliance Model Ordinance language: “A development plan shall include provisions to retain natural predevelopment watershed areas on the site by using the natural flow patterns.”

Several additional references reviewed recommended the following:

- Installation of cross culverts in accordance with principles to preserve the natural water way characteristics.

The Maine Model Road Design standards recommends installation of culverts in accordance with Maine Stream Smart Principles, and this practice is becoming widely accepted for larger projects and would be appropriate for incorporation as an LID strategy in Maine.

Recommendation: To address LID Measure 2 - Protect Natural Drainage Systems in rural and suburban areas, the Model Ordinance should:

- Require that Culvert Crossings for any Waters of the State of Maine use Maine Stream Smart Principles to preserve the natural pre-development drainageways.
- Require that developments preserve the natural pre-development drainageways on site by using the natural flow patterns and pathways for the post-construction drainage system.

- Exceptions were added during the comment period, and language was adjusted to better reflect Chapter 500 definitions.

4.3 Measure 3 - Minimize the decrease in time of concentration

Discussion: One of the standard LID strategies is to ensure no decrease in the time it takes for a water droplet to reach its discharge or treatment point (time of concentration).

Possible strategies to achieve this include breaking up or disconnecting the flow or runoff over impervious surfaces (creating small catchment areas), building upon the requirements to not divert the post-development flow from its pre-development path (in Measure 2 above), and controlling the volume of water leaving the site. Many of the references reviewed categorized their volume control requirements in terms of minimum infiltration or groundwater recharge requirements. The end goal for this Measure will be to ensure the post-development peak flows do not exceed the predevelopment peak flows, and to incorporate some measure of volume control for the site.

The specific discussion and recommendations related to both peak flow as well as volume control are provided in the following subsections.

4.3.1 Peak Flow Control

Discussion: Chapter 500 already contains a provision for the sites that are large enough to trigger the Flooding Standards (sites with 3 new acres of impervious area or 20 new acres developed area). The Maine Climate Council documents recommend applying the Maine Chapter 500 Flooding Standard to a smaller threshold of sites but does not provide a specific recommendation of site size. Application of the Flooding Standard to smaller sites

could have the unintended negative consequence of undermining the intent of several other LID measures, such as Measure 1 Minimize Site Clearing and Measure 2 Protect the natural drainage system. If additional water is required to remain on-site stormwater treatment measures may need to be oversized, causing additional disturbance and development.

Most of the references reviewed, as well as Chapter 500, require developers to meet this peak flow restriction by analyzing the 24-hour 2-year, 10 year and 25-year storm events.

New Hampshire (Ref 10 and 11) recommends adding a 50-year storm event to the evaluation but includes runoff retention requirements for groundwater recharge.

Massachusetts guidance (Ref 12) recommends adding a 100-year storm event to the hydraulic evaluation, though this recommendation is from 2008, and can result in the unintended consequence of requiring more development on-site to detain flow. As for the Flooding standard above, it was not possible during this project to conduct a thorough review of all the potential advantages and disadvantages of this performance standard, so it was not included in the recommendations for the final Model Ordinance.

Most reviewed references also require using updated precipitation data that reflects more intense precipitation that has been occurring in recent years. NOAA Atlas 14 and Northeast Regional Climate Center (NERCC) precipitation data are the standards recommended by the New England references as well as the Maine Climate Council. However, Maine DEP reviewed this data and ran several scenarios using HydroCad. They found no difference in

the results, and so we removed this requirement from the standards, but have added it to the Chapter 500 recommendations.

Recommendation: No new standard. The recommended performance standards for Measures 2 and 10 also address this measure.

4.3.2 Volume Control (Groundwater Recharge Retention)

Discussion: The Maine Climate Council documents recommend increasing the volume of water that needs to remain on site but did not provide a specific standard. Most of the references reviewed included recommendations to control the volume of water leaving the site via groundwater recharge according to the Natural Resources Conservation Service hydrologic soil groups present on site, though at varying percentages for each group. Maine DEP Chapter 500 does not require infiltration but does allow infiltration of stormwater runoff post development. When infiltration Stormwater Treatment Measures are used to treat stormwater runoff in Maine, applicants must conform to the specific standards laid out in Appendix D of Chapter 500. Additionally, Maine DEP stormwater rules prohibit infiltration of treated stormwater runoff into any soil whose permeability exceeds 2.41 inches per hour without a DEP approved pollutant removal medium.

In New Hampshire, infiltration is only required when an applicant has reviewed and can comply with the restrictions on infiltration contained in the State Alteration of Terrain development rules. A few of the restrictions listed in the rules include: no infiltration in protected drinking water recharge areas, in areas with soil contamination, or in areas with slopes greater than 15% to ensure stability, and infiltration rates are limited to 10 inches per hour.

Although the rules associated with the remaining references reviewed list additional restrictions and exemption associated with infiltration, the list and approach taken in New Hampshire is a responsible, reasonable approach which could be taken in Maine only if the Maine DEP were to update Chapter 500 to require some form of volume control.

Questions and comments during technical review required clarification that this standard is to promote base flow for streams and recharge to groundwater, so that Stormwater Treatment Measures with liners cannot be used to fulfil the infiltration/storage requirement.

Recommendation:

The NH infiltration standards should be required in the Model LID ordinance.

4.4 Measure 4 - Minimize Impervious Area

Discussion: Regulation of the amount of impervious area at a development site can be accomplished in a number of different ways. The references reviewed provided the following:

- Requiring the developer to limit impervious surfaces to the extent practicable (without any specifics on how). This method is not recommended because of the difficulty associated with defining what “extent practicable” means for any given site and the potential liabilities that municipalities would assume.
- Setting aside a percentage of the buildable lot to be open space (see Minimize Site Clearing for discussion).

- Limiting the overall area of a lot or project to a specific square footage or % of lot or buildable lot. The documents that provided recommendations applied to smaller sites (less than one acre of land disturbance), with the exception of the Brunswick Rural Protection Stormwater Management Overlay Zone, which recommended limiting impervious surfaces in the Resource Protection (RP)1 and RP2 zones as follows:
 - For RP1 lots 0 to 2.5 acres, limit Impervious area to 10,890 square feet or 35% of the lot whichever is less) (increased to 21,780 square feet or 40% for RP2 lots).
 - For lots 2.5 to 10 acres in size, the impervious area can be increased by 10% of the lot size.
 - Additional increases in impervious cover % are allowed for increasing lot sizes.
- Providing specific performance standards for the four main ways in which impervious surface is added to a site: buildings, roads, parking areas and sidewalks.
 - Although the Maine DEP Chapter 10 Guidance suggests providing incentives to build vertically with regard to buildings and parking garages, there were no specific standards present in the references reviewed.
 - The only specific performance standards were related to roads and sidewalks. The Maine Model Road Design Standards (Ref 7 SMPDC 2021) document provided several standards that should be incorporated into the Model Ordinance. Some of the recommendations from this document are incorporated into other LID Measures, but the ones that should be incorporated into this measure are:
 - Road layouts should minimize total impervious area. Except in cases where unusual topographic conditions may make it advisable to modify these

provisions, dead-end streets shall be no longer than 1000 feet (including any cul-de-sac or hammerhead). Dead end roads shall be constructed to provide a tear drop cul-de-sac turn-around or hammerhead or be converted to a loop road.

- Cul-de-sac roads should require a landscaped island to be placed in the center of the cul-de-sac to decrease impervious surfaces and improve stormwater drainage. A bioretention basin or bioretention cell (along with proper road grading) may be used to increase stormwater drainage and treatment. Where an island is not practical, the governing body may allow for alternative designs with porous pavement or block pavers.

Extensive discussion in the Ordinance Committee meetings regarding the following recommendations from the Maine Model Road Design Standards resulted in a determination that these standards not be included in the LID Model Ordinance due to safety concerns:

- Where possible, no curbing shall be installed, and instead vegetated open-channel conveyance systems and accompanying LID features, such as filter strips and swales, shall be used.
- Where possible, sidewalks shall be placed next to a buffer strip that extends a minimum of 4 feet from the road edge and may be landscaped with native plantings and LID features.

- Several references recommended a parking space size with a 9-foot width and an 18-foot length and allowing developers to reduce the 18-foot length if an equivalent overhang was provided.
- For sidewalks, several references in addition to the Maine Model Road Design Standards recommended that sidewalks only be located on one side of a road in rural areas and subdivisions. However, this potential standard was not included because many municipalities are working towards promoting connected walking and biking paths, which includes sidewalks.

Recommendation: To address this LID Measure 4 - Minimize Impervious Area, the Model

Ordinance should incorporate the following:

- Optional: dead-end streets be no longer than 1000 feet (rural and suburban areas).
- Optional: dead end roads shall be constructed to provide a tear drop cul-de-sac turn-around or hammerhead or be converted to a loop road (rural and suburban areas).
- Optional: cul-de-sac roads include a landscaped island to be placed in the center of the cul-de-sac to decrease impervious surfaces and improve stormwater drainage. A bioretention basin or bioretention cell (along with proper road grading) may be used to increase stormwater drainage and treatment. Where an island is not practical, the governing body may allow for alternative designs with porous pavement or block pavers (rural and suburban areas).
- Parking standards:

- 1) Optional: Incorporate maximum parking space size with a 9-foot width and an 18-foot length and allow developers to reduce the 18-foot length if an equivalent overhang was provided in all developments.
 - 2) Required: Incorporate maximum car parking standards (9-foot by 18-foot spaces) with exceptions allowed for public safety considerations
 - 3) Optional: Ensure parking volume requirements are up to date, including establishing maximum parking limits in appropriate areas. Reduction or elimination of parking may be conditional on presence of transit routes within ¼ mile, existing on-street parking, and creation of a transportation demand management (TDM) plan for projects over a certain size (10k SF in Portland).
- Other optional Standards:
 - 1) Establish “In Lieu” of Parking programs with the following components:
 - 2) Fee in lieu of parking (Note that the in-lieu program may optionally be tied to incentives, such as density or height bonuses).
 - 3) Car-share-in-lieu of parking
 - 4) Transit-in-lieu
 - 5) Bike/pedestrian infrastructure improvements
 - 6) Establish shared parking provisions
 - 7) Required parking garages under/above building where appropriate, optionally tied to a density or height bonus.

4.5 Measure 5 - Minimize the Effect of Impervious Area

Discussion: This LID Measure contains several subcategories which relate to the overall concept of breaking up drainage areas into small components and treating the runoff from the areas close to the source. Chapter 500 LID Credits require that these drainage areas be no greater than one acre. Recurring specific standards related to this Measure in the references reviewed included:

- Requirements to ensure that road runoff is directed into treatment swales and/or vegetated buffers (without curbing if slopes allow), though directing into buffers may not be reasonable in Urban areas.
- Infiltrating roof runoff (Chapter 500 only requires treatment for thermal impacts and stream channel protection if the roof is a non-industrial site, so this may be infiltrated without the need for additional permitting).
- Requiring porous pavement for sidewalks and peak-use overflow parking. Discussion during the Ordinance Committee meetings concluded with a determination to exclude this requirement because of potential for pollutant infiltration, and because of longevity issues with porous pavement.

Recommendation: To address LID Measure 5 – Minimize the Effect of Impervious Area, the Model Ordinance will:

- Require that road runoff be directed into treatment swales and/or vegetated buffers
- Require that roof runoff be directed to Stormwater Treatment Buffers or Stormwater Treatment Infiltration Measures.
- Require that runoff from sidewalks and peak use overflow parking is directed into Stormwater Treatment Buffers or Stormwater Treatment Infiltration Measures (rural and suburban areas).

4.6 Measure 6 - Minimize Soil Compaction

Discussion: This Measure has some overlap with several other LID Measures because keeping a small disturbance footprint, showing the area to be disturbed on the development plans, minimizing impervious area, and ensuring buffers are protected should automatically minimize soil compaction. However, several references contained recommendations that will be included in the Model Ordinance to ensure soil compaction is minimized. These are:

- Restricting construction equipment movement and parking to the disturbed area only.
- Requiring rototilling of all areas to be vegetated.

Recommendation: To address LID Measure 6 - Minimize Soil Compaction, the Model Ordinance should:

- Restrict construction equipment movement and parking to only the disturbed area.
- Require tilling of and the addition of organic matter to all areas to be vegetated based on results of soil tests.

4.7 Measure 7 - Minimize Lawns and Maximize Landscaping that Encourages Runoff Retention

Discussion: This LID measure also has some overlap with other LID Measures such as Minimize Site Disturbance and Minimize Impervious Area. None of the references reviewed provided restrictions on the amount of lawn or landscaped areas for developments, but most provided recommendations to use native plants for landscaped areas. Several

references also specifically required the use of native trees for urban areas. The Maine Shoreland Zoning requirements have required use of native plants for many years. The Stormwater Management for Maine Design guidance manual recommends use of native plants for rain gardens and other Stormwater Treatment Measures, but does not require Native Plant use. Native plants do not require as much fertilizer, water or pesticides when properly located, and provide food, shelter, and shade to Maine wildlife.

Recommendation: To address LID Measure 7 – Minimize Lawns and Maximize Landscaping that Encourages Runoff Retention, the Model Ordinance should:

- Require the use of Maine Native and Climate-resilient Northeastern native plants in landscape areas. (Note that Measure 1 Minimize Site Clearance contains a related requirement to preserve native vegetation in Buffer areas).
- Exceptions are allowed to preserve the right to grow food (a recent amendment to the Maine Constitution).

4.8 Measure 8 - Provide Vegetated Open-Channel Conveyance Systems

Discussion: This LID Measure contains an element that is currently listed in Chapter 500 as an LID credit: "viii. Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas".

LID Measure 5, Minimize the Effect of Impervious Cover, recommended discharging road runoff to treatment swales or vegetated buffers.

No additional specific performance standards were identified in the references reviewed for this LID Measure.

Recommendation: The recommendation from LID Measure 5 (discharging road runoff to treatment swales or vegetated buffers) is consistent with this LID Measure. No additional performance standards are recommended.

4.9 Measure 9 - Rainwater Capture and Re-Use

Rainwater storage and re-use is generally recommended by most of the references reviewed as a good LID strategy, but none require it, and none provide any performance standards associated with it.

Recommendation: To address this LID Measure 9 – Rainwater Capture and Re-Use, the Model Ordinance should:

- Provide the following as an optional performance standard: the capture and re-use of water via cisterns or rain barrels for later reuse for landscaping or buildings.

4.10 Measure 10 - Stormwater Quality Treatment and Retention Requirements

Discussion: New Hampshire and Massachusetts references reviewed require treatment to remove Total Suspended Solids (TSS), Total Phosphorous and Total Nitrogen from new or increased impervious area runoff, though each requires removal of a different percentage. New Hampshire requires removal of 80% of the TSS and 50% of the nitrogen and phosphorous, while Massachusetts requires removal of 90% of the TSS and 60% of the total phosphorus (no nitrogen requirement). Calculations are made on an average annual load,

based on the Stormwater Treatment Measures selected by the developer. Both states apply a lower threshold for treatment to redevelopment sites. New Hampshire allows developers to provide treatment at an off-site location within the same watershed if insufficient space is present on-site for Stormwater Treatment Measures. New Jersey requires removal of 80% of TSS but relies on the use of LID Stormwater Treatment Measures listed in the manual to also remove nitrogen and phosphorous, so no pollutant removal percentages are applied to these nutrients. In Prince Georges County, Maryland, the strategy to treat pollutants from the impervious surfaces of developed areas is to control the peak flow off-site and to provide volume control, while requiring use of specific Stormwater Treatment Measures listed in the manual that are known to remove TSS and nutrients.

Finally, the Center for Watershed Protection Codes and Ordinances Workshop includes a general recommendation to require water quality treatment of runoff but does not provide recommendations on how to accomplish this treatment.

In Maine, Chapter 500 requires stormwater quality treatment using pre-approved Stormwater Treatment Measures (listed in the chapter), treating a volume equal to one inch multiplied by the impervious area, plus 0.4 inches multiplied by the landscaped areas. The pre-approved Stormwater Treatment Measures required to be used in Maine are the same BMPs being used in Massachusetts and New Hampshire to meet the percent removal requirements for TSS and nutrients, but Maine developers are not required to provide calculations showing what percent removals are anticipated. These pre-approved Maine Stormwater Treatment Measures are also listed in the Prince Georges County and New

Jersey regulations where, like Maine, there are no specific nutrient removal percentage standards (except that NJ does require 80% TSS removal).

It would not be appropriate for municipalities to adopt percent removal requirements in their ordinances unless the Maine DEP also updates Chapter 500 to do so. And it is not clear if there would be benefits to water quality by requiring the percent removals. The Maine approach (requiring the use of specific Stormwater Treatment Measures that are known to provide water quality treatment) is consistent with the New Jersey and Prince Georges County approaches to LID. Therefore no additional standards for nitrogen, phosphorous or total suspended solids treatment are needed.

The Maine Chapter 500 definition of LID requires that any Stormwater Treatment Measure being considered for this credit be restricted to treating only one acre of contributing impervious cover. This restriction is consistent with general LID practices to break up the impervious areas of the site and treat with smaller sized systems.

Additionally, the LID Model Ordinance will be requiring water quality treatment using Chapter 500 Stormwater Treatment Measures at a one-acre threshold, which is much lower than the current Chapter 500 thresholds for development and impervious cover.

Recommendation: To address this LID Measure 10 – Stormwater Quality Treatment and Retention Requirements, the Model Ordinance should simply apply the Maine DEP Chapter 500 General Standards for water quality treatment to sites that disturb one or more acres

of land and require that any Stormwater Treatment Measures be limited to treating a maximum of one acre of impervious area (per Treatment Measure).

4.11 Other LID Measures not required by the MS4 General Permit

Appendix B contains several additional potential LID Measures that are not required by the MS4 General Permit or the Maine Climate Council. The other potential measures were divided into the following categories:

Pollutant Control – Discussion: The New Hampshire references contain requirements for development sites to submit Spill Control and Countermeasure Plans if the site will store more than 5 gallons of a “regulated substance” (undefined) to the local Fire Chief or emergency response official. This threshold is exceedingly small, and this standard would be very time consuming to enforce if the property changed hands and a new owner took over. Additionally, several federal regulations related to storage of hazardous substances include Oil Spill Pollution Prevention Regulations (located at the Code of Federal Regulation Title 40, Chapter 112) which requires an Oil Spill Control and Countermeasure Plan be prepared, and Tier II regulations (40 CFR Part 355) which requires emergency responders (including fire departments) be notified if facilities are storing more than 10,000 lbs. of a hazardous substance on-site. Though the Tier II regulations contain some smaller thresholds for extremely hazardous substance, they do not require any spill plan document to be prepared, nor any secondary containment. These federal regulations apply in Maine, and there are not any reduced thresholds applicable in Maine. Therefore, there are no additional recommendations related to storage of pollutants on a site.

Salt/Chloride Control Discussion: New Hampshire has requirements for private developers to track salt use online using a UNH Tech Transfer Center online tool and offers liability protections to applicators who obtain a Green Snow Pro Certification, but Maine has no such tracking tool or liability protection. MS4s have requested that DEP embark upon development of this type of State regulation, but short staffing and insufficient funding has prevented this program from being initiated at the state level. It is beyond the scope of this project to embark upon development of a similar program for Maine, therefore no requirements related to private developer chloride tracking or salt use reduction are being made.

Snow Management Discussion: Several references did recommend snow storage areas be identified on all site plans, and Maine DEP Chapter 500 prevents snow from being stored in any Infiltration Stormwater Treatment Measure. Chapter 500 does not explicitly prohibit snow disposal in other Stormwater Treatment Measure and Shoreland Zoning regulations do not prohibit snow disposal in protected Shoreland Buffer areas.

Snow Management Recommendation: These two items are recommended to be part of the Model Ordinance:

- Require that all site plans show snow storage areas.
- Prohibit snow storage in any Stormwater Treatment Measure or Shoreland Zoning Buffer.

No other recommendations were identified for the Model Ordinance.

5 Considerations for Municipalities Adopting Recommendations

The Model Ordinance was developed to be a resource for Maine MS4 municipalities but may be adopted by any municipality in Maine. As municipalities begin the adoption process, after the Model Ordinance is created, they will want to consider the following items:

1. Each municipal code provides different standards and applies them in different ways. A full review of the entire municipal code should be conducted as the LID strategies are adopted to ensure consistency with Comprehensive Plans and to eliminate conflicting standards.
2. Application of the required elements relative to urban, rural, and suburban areas may be conducted using existing zoning designations as described in Section 4. However municipalities may want to apply the standards to different areas based on either: minimum lot size or Growth Area designations.
3. Though MS4 municipalities must implement the required elements in the Urbanized Area (i.e., the area regulated by the MS4 General permit), they may want to apply the requirements to all areas of town.

6 Recommendations/Needs for Moving Forward

Some LID Strategies were specifically not recommended for incorporation into the Model Ordinance because they would either conflict with existing state regulations, or they would take too much time to properly assess for technical viability. In addition, because the Maine DEP is embarking on a stakeholder process to update Chapter 500, it was not appropriate to include some standards at this time until that process has concluded. During the research phase and Ordinance Committee discussions, the following items were identified as areas that Maine DEP should consider addressing at the state regulatory level:

- a. Applying LID standards to sites smaller than the current thresholds in Chapter 500, using these recommendations as a guide (5,000 square feet of new impervious area)
- b. Groundwater recharge/volume control such as is required in Massachusetts and New Hampshire
- c. Develop standards for rainwater capture and re-use.
- d. Adopt TSS and nutrient removal efficiency standards such as those being used in New Hampshire and Massachusetts.
- e. Adding the 50-year or 100-year 24-hour storm to the Flooding Standard as recommended in New Hampshire and Massachusetts.
- f. Requiring the preservation of Maine Native and Climate-Resilient Northeastern Native Vegetation in Shoreland Zoning Buffer Areas, and requiring their use in

Stormwater Treatment Buffers (Vegetative Buffers in Appendix F of Chapter 500).

- g. Conduct a more detailed analysis of the NOAA Atlas 14 and Northeast Regional Climate Center (NERCC) precipitation data, which are the standards recommended by the New England references as well as the Maine Climate Council.

7 References

The following is a listing of References with Performance Standards on excel table

1. Techniques from Maine Stormwater Management Design Manual Chapter 10 LID Practices and Techniques (2016 Guidance)
2. Maine DEP Chapter 500 Stormwater Management (State Stormwater Regulation)
3. Maine DEP Chapter 1000 Guidelines for Municipal Shoreland Zoning Ordinances
4. Boothbay LID Provisions for Shoreland Zoning (Kennebec County SWCD/Kennebec Valley Council of Governments April 2010)
5. LID Guidance for Maine Communities (Horsley Whitten Group, 2007)
6. Brunswick Rural Protection Stormwater Management Overlay Zoning District (CCSWCD 2019)
7. Model Road Design Standards (SMPDC August 2021)
8. Coastal Resilience Ordinance Review (SMPDC January 2021)
9. New Hampshire MS4 General Permit and NH - SE Watershed Alliance - 2012 Ordinance (Section 4 Elements C and D)
10. NH - SE Watershed Alliance - 2017 updated ordinance
11. NH - SE Watershed Alliance - 2019 updated ordinance
12. MA MS4 Permit (Specific citations from Massachusetts Stormwater Handbook, or other federally or State approved design guidance).

13. Codes & Ordinances Worksheet Update -Center for Watershed Protection 2017 (update of Better Site Design)
14. Prince Georges County Maryland LID National Manual
15. New Jersey Site Design Manual – Chapter 2 Low Impact Development.
16. Vermont Green Streets Guide 2018

The following references provide general information on LID, but do not contain performance standards listed on the excel table. These references provided background for this White Paper.

17. USEPA, Office of Wetlands, Oceans, and Watersheds, 2021, “Revising Local Codes to Facilitate Low Impact Development”, USEPA Document number 841-F-19-002 June 2021
18. USEPA LID Terminology Fact Sheet
19. New England Environmental Finance Center LID Fact Sheet
20. [Maine Won't Wait: A Four-Year Plan for Climate Action](#) adopted by the Maine Climate Council December 1, 2020
21. Community Resilience Planning Final Strategy Recommendations June 2020. Emphasize Resilience Through Land-Use Planning and Legal Tools: • Develop and implement updated land-use regulations, laws, and practices by 2024 in order to enhance community resilience to flooding and other climate impacts. (p. 15)
22. Report to the Joint Standing Committee on the Environment and Natural Resources: “Result of Analysis Required by 2021 Public Law, Chapter 67, Resolve, to Analyze the Impact of Sea Level Rise (January 2022).
23. Maine MS4 General Permit, Issued October 20, 2020, amended November 23, 2021.
24. TBD
25. Southeast Watershed Alliance Study
26. Maine Climate Adaptation Guidance Series (2017)

APPENDIX A

Ordinance Committee and Technical Expert Panel Members

The following table shows the members of the Ordinance Committee who contributed to the development of this White Paper.

Name	Role	Affiliation
Abbie Sherwin	Meeting Organizer	SMPDC
Aimee Mountain	Interested Party	GZA
Ali Clift	Meeting Organizer	CCSWCD
Amanda Lessard	Municipal	Windham
Amy Aiguier	Municipal	South Berwick
Andrea Dickinson	MS4 Consultant	Haley Ward
Angela Blanchette	Municipal	Scarborough
Aubrey Strause	Interested Party	Acorn Engineering
Ben Parker	Interested Party	FOCB
Brenda Zollitsch	MS4 Consultant	Zollitsch Consulting
Cara Belanger	MS4 Consultant	SEE/Veazie
Chris Baldwin	Technical Review Panel	CCSWCD
Christine Rinehart	MS4 Consultant	Wright-Pierce
Craig Chekan	Municipal	Biddeford
Damon Yakovleff	Meeting Organizer	CCSWCD
Dave Russell	Municipal	Old Town
Doug Greene	Municipal	Lewiston
Doug Roncarati	Municipal	Portland
Fred Dillon	Municipal	South Portland
Gretchen Anderson	Municipal	Windham
Ivy Frignoca	Interested Party	FOCB
James Bellissimo	Municipal	Berwick
James Houle	Technical Review Panel	UNH
Jeff Brubaker	Municipal	Eliot
Jessa Kellogg	Municipal	Kittery
Jim Katsiaficas	Technical Review Panel	Perkins Thompson
Jodie Keene	Municipal	Portland
Joe Laverriere	Municipal	Saco
John Kuchinski	Municipal	Lewiston
Kathy Connor	Technical Review Panel	Kittery
Kerem Gungor	Interested Party	DOT
Kristie Rabasca	Meeting Organizer	IEE

Name	Role	Affiliation
Leslie Hinz	Municipal	York
Linda Johns	Municipal	Brewer
Lynn Leavitt	Municipal	Westbrook
Maeghan Dos Anjos	Interested Party	Woodard & Curran
Marybeth Richardson	Technical Review Panel	DEP
Megan Hess	Municipal	Orono
Peter Carney	Interested Party	LCWMD
Philip Ruck	MS4 Consultant	SEE/Veazie
Priscilla Botsford	Interested Party	Ogunquit
Rebecca Graham	Interested Party	MMA
Richard May	Municipal	Bangor
Ron Kelton	Municipal	Portland
Rosalie Starvish	Technical Review Panel	GZA
Sarah King	MS4 Consultant	Haley Ward
Scott Gorneau	Interested Party	CWT
Steve Johnson	Municipal	Yarmouth
Steve Puleo	Municipal	Windham
Tammy Bellman	Municipal	Berwick
Tom Milligan	Municipal	Biddeford
Zachary Henderson	MS4 Consultant	Woodard & Curran
Mike Foster	Municipal	Old Orchard Beach
Clifton Iler	Municipal	Hampden
Jen King	Municipal	Brewer

APPENDIX B

Spreadsheet: Comparative Review of Low Impact Development Performance Standards